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THE SURGICAL ASPECTS OF DISEASE OF THE BILIARY TRACT.

By Abraham O. Wilensky, M.D.
NEW YORK.

(From the Mount Sinai Hospital, New York.)

Inflammatory disease of the gall-bladder—cholecystitis and cholelithiasis—is most commonly an affection of middle age, occurring with special frequency in women and closely associated with the incidence of pregnancy. Many cases probably originate early in life and persist with no or only vague and indefinite symptoms until some time later; manifestations are known to occur in very young children, as shown by the collected statistics of Montgomery and Wolf, and Friedenwald and Ulmann. Such diseased conditions of the gall-bladder and bile passages may, for practical purposes, be divided into those in which gall-stone formation does not occur and those in which the occurrence of calculi in some part of the biliary system outshines by its presence those other elements of the clinical picture which perhaps have a more important bearing than the stones themselves.

As one meets these conditions on the operating table the various pathological pictures which one encounters are essentially the following:

1. Gall-bladders of a normal size and shape which show a practically normal histological structure: The contents consists of a thin light-colored bile or more rarely a viscid darker bile, together with a variable number of stones. The gall-bladder contents are very frequently bacteriologically sterile.

2. Dilated gall-bladders showing a normal or only slightly abnormal histological structure and containing a single stone, which frequently is impacted in the neck of the gall-bladder or in the

cystic duct. The contained bile is rather thin and frequently is bacteriologically sterile.

3. Large distended gall-bladders the walls of which show moderate or marked grades of atrophy, especially of the mucous membrane and muscularis: There are usually a large number of various size stones which lie loosely in a large amount of thin bile. Stones may also be present in any of the ducts.

4. Gall-bladders in which infection has taken place, containing a thin pus or more rarely a thick, creamy pus with stones: The walls of the gall-bladder are thickened and edematous and the mucous membrane is very frequently gangrenous. Abscesses may be present in the wall of the gall-bladder, between it and the liver bed, or, more rarely, in the substance of the liver a short distance away. The stones contained in the gall-bladder may be numerous, indicating that conditions correspond to Groups 1 and 3, with an added infection, or only a single stone is present, indicating that a hydrops, as described in Group 2, has become secondarily infected. In all of these the cystic duct usually becomes shut off. Stones may be present in any of the ducts.

5. Gall-bladders which have shrunken to less than their normal size, and the walls of which show a chronic productive inflammation, frequently with areas in which the evidences of a more recent inflammatory reaction is discernible. The amount of pericholecystitis varies from a minimum to an excessive degree, in which it seriously hampers the necessary operative manipulations. The contents of the gall-bladder may consist only of stones or bile, which may or may not be purulent, or of both of these; or thick emulsions of cholesterin containing fragmentary stones are present. When the cystic duct is open and a probe can be passed into the hepatic and common ducts the condition represents the end-results of Groups 1, 2 and 3; when the cystic duct is obliterated the condition is the end-result of Group 4. It very rarely happens that the scarring and contracture has advanced so far that only a short stump represents the gall-bladder; such a finding represents a very near approximation to a natural cure, but only when no calculi are present in any part of the biliary apparatus.

6. Gall-bladders corresponding to any of these groups, and with which there is associated a swelling of the head of the pancreas; this includes the acute and chronic forms of pancreatitis.

7. Inflammatory gall-bladder conditions without the formation of calculi. The group includes the acute and chronic forms of catarrhal cholecystitis and the acute and chronic empyemata of the gall-bladder, both of these with and without various degrees of pericholecystitis. In the acute cases bacteria can usually be cultivated from the wall or from the contents of the gall-bladder.

8. Gall-bladders corresponding in structure to those in Group 5, but without stone formation. These represent the end-results of those in Group 7.

In any or all of these groupings the available knowledge indicates that the biological sequence of events may be one of three:

1. The pure infections indicated best in Groups 7 and 8. The element of any metabolic disturbance cannot enter unless there is a complicating non-calculous obstruction of the common duct. The affection begins as a catarrhal cholecystitis, progresses rapidly to suppuration or subsides more or less incompletely; when repeated recrudescences of infection are permitted the lesion terminates in the contracted and shrunken gall-bladder of Group 8.
2. The cases that orginate in some disturbance of the cholesterin metabolism. Most often these are initiated by the physiological changes which accompany pregnancy. The hypercholesterinemia of pregnancy may reach to such a degree as to make futile the normal compensatory mechanism; then the supersaturation of bile with cholesterol bodies is reduced to the normal by a precipitation of stones in some portion of the bile passages, almost always the gall-bladder. If no further hypercholesterinemic crisis occurs, or if no infection supervene, these patients have symptoms which are due to the mechanical effects of the stones acting as foreign bodies.
3. Combinations of infection and disturbed cholesterol metabolism may occur either simultaneously or alternately, and with different degrees of severity: Depending on the factor which is paramount, on the intensity of the latter's manifestations, on the stage of the process, or on the presence or absence of the many complicating factors, which now become numerous, the pathological picture shows wide variations.

It must seem quite apparent and beyond argument that a careful consideration of the various pathological pictures portrayed in this communication must show that, once infection of any kind establishes itself in the gall-bladder—especially as is most often the case when stones are present—the resultant lesion is there to stay and that some mechanical means is necessary before it can be entirely eradicated. The various pictures are but stages of one another and the progression of the latter from the simpler to the more complex is but a matter of time and opportunity. Anatomical healing is rarely if ever complete, and most of the attempts toward its consummation result in increasing mechanical deformity which precludes the possibility of a natural and permanent relief of symptoms. And if the focus of infection be allowed to persist for any undue length of time its evil potentialities are quickly to be noted in neighboring organs, and the end-results include additional dangerous and sometimes unrelievable lesions, and are associated with increasing risks which attend an attempt at surgical relief.

Some newer studies have shown that associated changes are present in the liver itself. One sees this clinically in the easily palpable, enlarged, engorged, congested and edematous livers. Graham has shown that in cases of acute and subacute cholecystitis there is constantly present the evidences of inflammation characterized by a leukocytic infiltration of the interlobular and periportal sheaths; in the more severe cases the infiltration extends to the peripheries of the lobules, and is associated with edema, slight grades of necrosis and moderate fatty degeneration. Organisms were quite commonly cultivated from the liver tissue. In chronic cholecystitis the liver often presents a picture practically identical with that of an early cirrhosis. The inflammatory reaction appears to be principally a pericholangitis. One can see the basis in these findings for the persistence of infection in the liver, and in some instances, undoubtedly, this state of affairs causes a recurrence of symptoms after an apparently successful operation. The stones which come from the intrahepatic ducts—intrahepatic cholelithiasis—are most probably due to a persisting bacterial infection of the ducts and liver parenchyma.

The finding of lesions resembling those demonstrable in the early stages of cirrhosis is of particular interest, inasmuch as it indicates the possibilities with long-continued and neglected foci of disease. The studies of Ogata indicate that these may be the response to the bacterial element of the clinical picture and those of Rous and Larrimore that they may result from obstruction of the biliary drainage system. In human pathology it is very probable that both of these factors functionate; commonly stasis of bile is associated with bacterial infection and the formation of connective tissue in the liver parenchyma will be much enhanced thereby. In intrahepatic cholelithiasis a form of biliary cirrhosis is quite common.

There is considerable evidence also that the pancreas is secondarily involved in neglected cases of disease of the gall-bladder and bile passages. Infection travels very easily along the lymphatics from the primarily involved biliary tract to the pancreas and the various forms of chronic pancreatitis are probably a response to bacterial toxins as they spread within the confines of the pancreatic gland. The spread of infection from the biliary tract is first along the lymphatics of the gastro-hepatic omentum to the lymph nodes along the upper border of the pancreas and then to the gland itself. If the attacks of cholecystitis or cholangitis should be allowed to continue and repeat themselves chronic changes in the pancreas ought to be expected. The lesions in the pancreas are not limited to these chronic forms of inflammation: it is a fairly common experience to witness the hyperacute emergency of a fulminating acute pancreatitis resulting from the impaction of an apparently insignificant calculus in the ampulla of Vater—a frequently fatal lesion which might have been entirely prevented if the original condition in the biliary tract had been previously corrected by operation.

There are other important and dangerous lesions which can result from neglected gall-bladder disease. These, while not very frequent, are still common enough to be serious menaces, and in any large hospital experience one sees several of these every year. The danger of a free perforation of an acute empyema of the gall-bladder is not slight, and although in the majority of the cases the process is walled off so that only a pericholecystitic abscess results, occasionally these protective adhesions are absent and a general peritonitis of a most violent form results. It is no uncommon thing for a large gall-stone to ulcerate through the gall-bladder wall into an adherent viscus; among the difficulties that then ensue the most formidable is a stubborn infection of the bile passages which, aside from the dangers of the actual operation or operations is usually sufficient to finally cause a fatality. All of these can be prevented entirely if the underlying gall-bladder disease be recognized at an early stage and submitted to operation.

For all of us, and especially for the internist and general practitioner, the most important question must necessarily be: How shall gall-bladder disease be diagnosed at an early stage—early enough to obviate completely all of the unnecessary complications which can occur when the focus of disease is not eradicated in time? There is, unfortunately, no method of precision available at present with which this purpose can be accomplished except in a deplorably minor number of instances. One must therefore rely on the general manifestations and on those elicitable data which by their presence are presumptive evidence of gall-bladder disease.

Of all the available data the history is most important. The value of the history is very great in all disease referable to the upper abdomen and becomes predominant in disease situated in the gall-bladder and bile ducts. The clinical groups can be segregated as follows:

1. Cases in which there are one or more attacks of gall-bladder colic separated by periods of good health. Very frequently the first attack occurs in pregnancy or early in the postpartum period. The clinical picture is sharply demarcated and should be apparent even to the tyro.

2. Cases in which these attacks punctuate a constant condition of ill-health the manifestations of which, were it not for the definite attacks of colic, would be vague and indistinct and of no special discomfort to the patient.

3. Cases of dyspepsia in which the bulk of the symptoms is referred to the stomach. When as in the previous groups there are distinct attacks of acute or subacute colic it is easy to recognize that there are reflex relationships to the gall-bladder and that disease of the latter is primarily at fault; but in the others

these tell-tale marks of gall-bladder disease are not present and other evidence is necessary to make the proper diagnosis.

4. Cases in which the chief complaint is right-sided abdominal pain of no special severity and bearing the characteristics of no special symptom-complex. The clinical picture has marked resemblances to the complexes associated with dislocated kidneys in young neurotic females; to that of some of the chronic forms of appendicitis; frequently to that of ureteral stone; to other forms of intra-abdominal disease or to purely functional states. Diagnosis is always difficult in these patients and frequently is only decided at an exploratory laparotomy. To the observant medical mind these various clinical pictures differ essentially in the presence or absence of definite attacks of biliary colic typical of that accompanying the attempted or consummated passage of a gallstone down in the cystic or common ducts. When these attacks are present and are observed by a competent practitioner, or when their description as given by the patient tallies accurately with our notions of what a gallstone colic should be, they furnish indubitable evidence of the presence of disease in the gall-bladder or bile ducts—perhaps the most important single piece of evidence of any which can be obtained.

5. A fifth group of cases includes those in which a single acute inflammatory condition appears in the upper right abdominal quadrant, characterized clinically by a sudden onset with generalized abdominal pain rapidly localizing in the right hypochondrium, with nausea and perhaps vomiting, with rigidity and tenderness and most frequently with a palpably enlarged, distended and tender gall-bladder. These are the acute empyema cases having marked similarities to acute appendicular attacks and with all the necessity which the latter have for early if not immediate operation. Necessarily these must not be associated with the presence of stones, and such pure infections, especially in men, form a very common variety of gall-bladder disease.

6. The sixth group includes those cases in which, besides the usual manifestations of some acute condition in the right hypochondrium, there is added the manifestations of a general infection; these are the cholangitis cases. The clinical picture includes chills and high fever, marked prostration and other signs of a high grade of intoxication; sometimes it is possible to cultivate bacteria from the blood stream. The very acute cases carry a grave prognosis and are frequently fatal; or the process assumes a less virulent and more subacute form, and is part of the picture of the more neglected varieties of disease of the biliary apparatus. The very acute forms are uncommon and are also known to occur as operative infections; the subacute and chronic forms are relatively more frequent. In the latter it is quite probable that the actual process does not extend very far beyond the major divisions of the

primary hepatic branches in the majority of patients. The chronic forms of cholangitis ultimately become associated with new connective-tissue formations, suggestive of a biliary cirrhosis.

The evidence obtained by physical examination of the patient is second in importance in the diagnosis of disease of the gall-bladder and bile ducts; the possible data may be of two kinds: (*a*) Entirely negative, or (*b*) partially or definitely positive. The definitive data which are obtainable are the presence of a palpable mass (gall-bladder), the local and general signs of peritoneal inflammation and the presence of jaundice. When this elicitable evidence is of a positive nature it is almost always so decisive as to make unnecessary any further examination of any kind in order to establish a diagnosis; this is most liable to occur in the acute cases. In the chronic cases the physical examination is disappointting in that it usually adds no data of any kind.

The laboratory evidence which is useful in the diagnosis of gall-bladder disease is that furnished by the roentgenological examination of the patient. But positive findings are, unfortunately, neither the rule nor very common, even when other obtainable evidence is conclusive. A liberal estimate of the positive findings seems to be in the neighborhood of 25 per cent, although in the literature the claims of various workers put the positive results as high as 90 per cent. Except in these fortunate instances the laboratory evidences yield no help whatsoever.

The method devised by Lyon, of Philadelphia, is still in an experimental stage; the method holds promise. But much more work is still necessary to remove what sources of error are still present in order to put the method upon a basis reliable enough for general use in practical medicine.

To anyone who sees the actual pathology of disease of the gall-bladder and bile ducts exposed on the operating table day after day as outlined in this communication, it seems futile to say other than that these diseases are essentially surgical and susceptible of cure only by surgical means; medical treatment can at best be only palliative. And if the lesson can be learned, especially by the medical men who naturally see these cases first, of the great necessity of operating upon these patients at the earliest possible period of the disease—and that means as soon as possible after the diagnosis has been established—very much can be accomplished in a preventive way. Those who have opportunities of seeing the late results with their many unnecessary complications—and these are no uncommon things even now—need very little urging to bring their patients early to the surgeon; and the rest should learn by the experience of these others that the best way of curing the serious complications in the liver and pancreas, and the most efficient way of lowering the risks of any operative intervention, is by their total obviation in an efficiently done operation at an early period of the malady.

One should not be led astray by the enthusiasm of Lyon as regards the value of the intraduodenal use of magnesium sulphate as a therapeutic measure. The method is naturally limited and useless in cases in which the cystic duct is obstructed by calculus, by inflammatory adhesions or by extraneous masses, such as enlarged lymph glands or tumors; or in states of hydrops, or when a mass of inspissated bile or calcareous material completely fills the gall-bladder. Cholelithiasis, or acute, inflammations leading to acute and chronic empyema with or without gangrene, or any condition of a more complicated nature than the simplest, are entirely beyond the reach of this method. For such conditions the method, at best, can exhibit only slight degrees of palliation. Perhaps the only application of this therapeutic measure will be found in states similar to catarrhal jaundice.

The question as to the best form of surgical treatment for gall-bladder and biliary tract disease not only resolves itself into a discussion of the indications and contraindications of cholecystectomy as against those for cholecystostomy, but also into a discussion of the value of some form of biliary drainage. As a rule the long list of indications that one commonly observes in the literature, for which cholecystectomy is required, reads like a *resume* of the various pathologies to which the gall-bladder and biliary ducts are subject. To recapitulate these, cholecystectomy is indicated:

1. For acute and chronic empyemata of the gall-bladder, or for gangrenous gall-bladders, or for any gall-bladder inflamed to such an extent that complete restitution to the normal is not likely or even possible.
2. For hydrops or any similar condition in which a stone is impacted in the cystic duct, stricture formation in the duct, which is almost sure to follow, will prevent the permanent closure of any fistula.
3. For chronically inflamed gall-bladders with or without stones or for those thickened to such a degree that collapse of the wall is not possible to the extent of permitting a spontaneous closure of any fistula resulting from a cholecystostomy.
4. In cholelithiasis even when the gall-bladder wall shows very little or no pathological change.
5. For malignant conditions.

There is one further indication which increasing experience has shown both to include and outshine every other indication for cholecystectomy. There is constantly increasing evidence of the fact that a much superior permanent result is obtained in any instance in which a cholecystectomy is done as opposed to cholecystostomy, so that the best opinion at the present time is that a gall-bladder which is diseased enough to give sufficient symptoms to warrant an operation is one of little or no value, or is a menace to the patient's future health by reason of its potentialities for trouble and should always be entirely removed. This restricts the usefulness of cholecystostomy markedly and its field is found in certain associated conditions, such as pancreatitis. Here the indication is drainage of bile, but even this can be accomplished through a choledochotomy opening.

It is true that in any of the cases cholecystostomy may be unavoidable, because of its supposed lesser shock and operative risk as an emergency measure—let it be emphasized—not because of the essential nature of the pathology, but because of the enfeeblement due to age or associated disease or to the deterioration of the general resistance powers due to neglected primary or complicating conditions brought to operation at a comparatively late period. Under such conditions cholecystostomy is only a palliative measure. There is much evidence to prove the statement that in competent hands the manipulations necessary for cholecystectomy under ordinary conditions, and in the average run of cases, are not so very much more productive of shock than those necessary for cholecystostomy; what difference there is, is probably due to lessened resistance on the part of the patient, and whatever little added risk is present is more than compensated for by the very great superiority of the more permanent result.

The operation of cholecystectomy fulfils a double purpose:

1. It removes a local focus of infection. When the latter is strictly limited to the gall-bladder this can be completely done and the effect is permanent. In the cases, however, in which the focus of infection has spread beyond the limits of the gall-bladder itself, either into the ducts or perhaps into the liver substances, surgical removal of the entire infected area is not feasible or possible, and a complete cure follows only when efficient drainage is adequately carried out.

2. It removes the biliary reservior with its contained stones and stagnated, infected and changed bile. The latter represents part of the end-products of any disturbed metabolism which may have antedated the operation; there is no effect upon the metabolic activities themselves. In order to obtain any effect upon the latter it is necessary to institute bile drainage either by leaving the stump of the cystic duct open (an inefficient method) or by making an additional opening into the common or hepatic ducts (a most efficient method).

The operation of cholecystostomy accomplishes the following objects:

1. Bile drainage is a necessary concomitant and sequel to this operation; hence, cholecystostomy enables a better removal of the end-products of disturbed metabolism. Practically this results in a depletion of the cholesterol content of the blood (Wilensky and Rothschild) and is a beneficial effect upon the metabolic activities.

2. Cholecystostomy affords a surgical method, inferior to chole-

cystectomy for draining the infected area. This does not presuppose that the focus of infection in the gall-bladder has been removed, and apparent healing may take place before this source of infection has completely disappeared. Recrudescences of infection may therefore be expected and do actually occur; they form one of the important causes for the recurrence of symptoms after operation.

The escape of bile through a common duct biliary fistula is always complete for a variable length of time until the subsidence of inflammatory swelling and some dilatation of the duct permit a certain amount of bile to trickle into the duodenum; clinically this is demonstrated in the color of the stools. On the other hand the escape of bile through a gall-bladder fistula is complete only when there is associated a complete obstruction of the common duct or papilla of Vater, so that between these two common-duct drainage is much more efficient.

The effects of bile drainage have been summarized by Wilensky and Rothschild as follows:

1. With common-duct drainage the system is rapidly depleted of the accumulated products of an abnormal metabolism.

2. Gall-bladder drainage does not accomplish this extreme effect unless there be a concomitant obstruction in the common bile duct.

3. These effects are only obtained when the operation is properly done and all obstructions have been removed.

The good effect of bile drainage upon a disordered metabolism is probably in the nature of a recuperative process, founded upon the removal of abnormal amounts of excretory products; this seems to have marked similarities to the phenomena of fatigue and rest in muscle tissue associated with the accumulation and discharge of excretory bodies produced by cellular activity.

To these effects may be added:

4. Bile drainage is also an invaluable adjuvant in the control of any focus of infection in the intrahepatic biliary apparatus. For this purpose it is frequently necessary to continue it for many months' time.

The continued loss of bile from a biliary fistula has a deleterious effect upon the body. The symptoms that are likely to appear include: (*a*) Disturbances of digestion frequently associated with vomiting; (*b*) constipation of varying degrees due to an absence of bile from the intestinal tract; (*c*) depreciation in the general condition of the patient conducive to a lessened general resistance to any kind of trauma. These effects may be prevented by collecting the escaping bile and feeding it to the patient by the stomach tube.

The drainage of bile is one of the most important factors in any operation upon the gall-bladder and bile ducts. We have all learned to value the procedure extremely highly. To recapitulate: it decreases the engorgement in the liver; it depletes the body of any associated products of disturbed liver metabolism and exhibits a beneficial effect upon these activities; it is the only method we have for overcoming any retained focus of infection in the liver; what is more, it covers up and rectifies any fault of technic in the removal of stones and enables the spontaneous discharge of small intrahepatic calculi as these pass downward into the extrahepatic ducts; and what is most, by virtue of all of these it prevents many recurrences of symptoms and many secondary operations.

No drainage of any kind following cholecystectomy has been advocated by a number of men. Willis and Bottomley have published experiences with this technic. The disuse of drainage means and presupposes a careful dissection and separate ligation of the cystic duct and vessels and of a careful and painstaking aseptic technic. In this regard operative technic is repeating the experiences which were gone through in the earlier days of appendix surgery. I have referred to this refinement of technic on several previous occasions. Too little attention has been devoted to the possibility of a cleaner and safer technic in gall-bladder and common-duct surgery. This is no new practice and there is no reason why there should not be certain cases in which drainage of any form can be safely omitted. In this regard the gall-bladder has many analogies to the appendix; one does not drain every case of appendicitis, and wide experience has taught us when the drainage can be safely omitted. Experience in gall-bladder surgery is not so abundant as regards the omission of drainage, and until it is so, the insertion of a drain is perhaps a more conservative measure. I am quite sure that many times these drains are unnecessary, as evidenced by a lack of any discharge through the drainage tube and by the fact that the tubes can be safely removed at the end of twenty-four to forty-eight hours. A tube for so short a period of time in no wise delays the convalescence or the healing of the wound; certainly, it is the safest way of doing things, and the precaution would perhaps save the occasional patient that died of hemorrhage, leaking or infection.

Owing to the results of biliary infection, which is practically always present, and the fact that operation still comes comparatively late, the prognosis of interference for common-duct stone is generally unfavorable. In operating attention should first be given to the common duct, as this carries the greater urgency; attention is given secondarily to the gall-bladder if the condition of the patient and other factors permit.

Most of the literature on the surgery of the common bile duct emphasizes two points essential to a safe outcome: (*a*) That the common duct itself be well drained, and (*b*) that the abdomen be drained down to the line of suture. It has been pointed out, and quite rightly, that the infected ducts should be drained, as infection elsewhere is drained, and that closure of the common duct is not without the danger of leakage of infected bile. The possibility of closing the incision in the common duct for the sake of securing a cleaner and safer technic has been discussed by Richter; the common duct is a suitable drainage tube in itself by which the affected parts above may be drained if its patency is assured. Under any circumstances, however, the following conditions are, according to Crile, contraindications to the closure of the opening previously made in the common duct: (*a*) If there has been a stone in the papilla; (*b*) if the duct mucosa has been so injured as to cause hemorrhage; (*c*) if there is a probability of postoperative closure of the duct by swelling; (*d*) in the event of the probability that stones will come down from the liver; or (*e*) in conditions of marked disturbance of the liver matabolism. These various contraindications do not leave a very large field in which the refinement of technic advised by Richter can be considered if one takes into account the character of these various exceptions; at least one of these indications for drainage is almost sure to occur after almost every common-duct procedure.

In competent hands the mortality of uncomplicated gall-bladder operations is very small, certainly not more than 2 or 3 per cent. With the association of complicating conditions this becomes much higher; the mortality is highest in common duct obstruction by calculus. With the latter the mortality seems to depend on the following factors:

1. The age of the patient apparently has some influence, inasmuch as most of the patients who die are over fifty years old. Van Beuren's figures showed that the operation was more dangerous in men, as shown by a 45 per cent mortality among men and an 18 per cent mortality among women.

2. I quite agree with Gibbon and others that the mortality in gall-bladder infections depends very largely on whether or not a cholangitis is present; a cholangitis is one of the real dangers of gall-bladder disease. A patient having undoubted symptoms of gall-bladder infection should not be allowed to postpone operation because of this danger; the danger, if a true cholangitis develop, is one to life; in those fortunate cases in which it does not prove fatal the convalescence is prolonged and tedious. The high mortality of gall-bladder operations occurs in the cases with long-standing symptoms, with acute exacerbations of infection and with complications.

3. The mortality has direct mathematical relationships with the length of time for which symptoms are present before operation. The longer the symptoms are present the more chance for a fatality. The immediate severity of the symptoms before operation apparently makes no difference. For the general practitioner this point is

of the utmost importance, as it shows the very great necessity of bringing patients of this type to operation at the earliest opportunity. No amount of time spent in emphasizing this extremely necessary point should be considered wasted.

4. The presence of complications—pneumonia or pulmonary congestion, chronic or acute pancreatitis, nephritis, peritoneal abscesses, myocarditis or affections of the coronary arteries—increases materially the mortality. This goes hand-in-hand with the previous statement, inasmuch as if the patients are brought to operation early many of these complications can be obviated, or at least their intensity will not be enhanced by the continued presence of the inflammatory and infectious process in the gall-bladder and biliary tract.

5. There is no doubt that the skill of the operator is an important factor in these difficult operations: the length of time of the operation, the degree of trauma, the knowledge and ability to handle the technical difficulties, are all important factors in the mortality statistics. All of these, while perhaps of little importance in the average operation, become of extreme importance in the complicated, late or neglected forms of gall-bladder and bile-duct disease.

In cases of recurring symptoms after primary gall-bladder operations sufficient to warrant secondary explorations a variety of lesions are found. The most frequently found include (*a*) adhesions of various kinds; (*b*) stone in the gall-bladder or ducts or both; (*c*) persistence of infection; (*d*) biliary fistulæ; (*e*) common-duct obstructions of various kinds, including malignancies; and (*f*) chronic pancreatitis. In some of the cases more than one of the conditions enumerated are found.

Adhesions of one kind or another are found in all of the recurrent cases. The symptom-producing adhesions are very few in number, and are principally those that result in a partial obstruction of the pylorus or first portion of the duodenum. The symptoms caused by this deformity include those of the ordinary forms of cicatricial pyloric stenosis. The simple separation of adhesions is usually followed by only temporary relief. Gastro-enterostomy, or, better still, a procedure similar to the Finney pyloroplasty, is superior to the separation of adhesions in these cases. In an old case of extensive adhesions the operation of separating the latter and covering the resultant denuded surfaces is likely to be a very difficult procedure, attended with great risk of tearing the duodenum, and in some instances the colon. If a duodenal fistula result a most dangerous and difficult proposition is present with which one must deal; and in order to guard its proper repair, gastro-enterostomy with some form of unilateral pyloric exclusion is almost always advisable.

The second most common cause for the recurrence of symptoms is the presence of stone or stones. The failure to remove all the gallstones at the primary operation is the most potent cause for the recurrence of any symptoms. It is not always easy to determine whether these recurrent stones were overloooked at operation or whether they had actually formed again after the primary operation. The impression, however, is strong that in a few instances at least, reformation has taken place. On the other hand it is not always possible at operation to clear the two primary branches of the hepatic duct. Again, as in the attempt to remove a stone or stones from the hepatic duct, one or more may be displaced upward beyond the reach of the surgeon and thus later produce common-duct obstruction, which requires reoperation. Complete and prolonged drainage after the primary operation is essential for a preventive cure, and one should not hesitate to open the common or hepatic ducts to secure it; this applies perhaps with even greater force to the recurrent cases.

The third most common cause of recurrence of symptoms is the persistence of infection. Most often this happens after cholecystostomies. Non-calculous cholecystitis is a clinical entity distinct from the type associated with the formation of stones and justifies the removal of the gall-bladder.

Cases occur also of non-calculous, non-malignant duct obstruction due to structure, to scar tissue or to ulceration. The principles involved in the treatment of these forms of common-duct obstruction are practically the same; the duct is laid open to the extent of involvement and drainage is provided in addition to whatever other procedures are found necessary. Resection of the diseased portion and end-to-end anastomosis is best; anastomosis of the proximal end of the duct with the duodenum, with or without mobilization of the latter, after the several methods proposed, is the next best operation; reconstruction of the duct after the Sullivan method is a poor third best.

Biliary fistulæ are practically all the result of stone in the stump of the cystic duct or in the common duct; the fistula can be obliterated only by removing the cause.

Chronic pancreatitis, according to Deaver, also causes postoperative symptoms; for these drainage is very essential and should be carried out for comparatively long periods of time.

Duct drainage is also indicated, and is imperative in cholangitis which results from gall-stone disease; it must be continued for a number of weeks.

It is important to know that after cholecystectomy dilatation of the extrahepatic ducts is the rule and is to be expected. In the early and late periods after operation it is not uncommon for the ducts to become suddenly hyperdistended, possibly from some unidentifiable spasm of the sphincter; a clinical picture then results resembling minutely a typical attack of gall-bladder colic